

## 2006 Retired Engineer and Technical Assistance Program (RETAP) Student Project Summary



## B & P PROCESS EQUIPMENT

Howard Reedy, Senior, Mechanical Engineering Student  
Saginaw Valley State University

Project Title: Developing Bio-Diesel from Soy Bean Oil Using a Continuous Process

Mr. Howard Reedy was assigned to B & D Process Equipment, a chemical equipment manufacturer located in Saginaw, Michigan. The company manufactures prototype chemical processing equipment for numerous applications (i.e.: twin screw extruders, mixing blades, reactors, solid rocket booster fillers, and etc.).

Mr. Reedy was successful at implementing a continuous process for making bio-diesel fuel from soy bean oil. The new process significantly reduced the time (less than 30 percent) needed to make bio-diesel fuel, while minimizing waste and unwanted byproducts. B & D Process Equipment had designed an existing device called the I-Pod, which is used in a variety of chemical processes. The intern used this I-Pod device to serve two functions: the first function allows the complete phase separation of bio-diesel and glycerin, through a two step (split) process; and the second function uses counter-current water washing to reclaim residual alcohols and hydroxides from the raw bio-diesel. Test results of the bio-diesel yielded a 99 percent conversion rate of soy bean oil to bio-diesel; exceeding the American Society for Testing and Materials requirement of a 97.7 percent conversion rate for bio-diesel fuel. A small prototype of the complete process is under development, to be completed this winter. The pros of this continuous process, over the existing process, include the following:

- Significant decrease in production time needed to produce bio-diesel;
- Significant increase in production efficiency;
- Lower capital cost for equipment;
- Less production space needed for equipment;
- Ability to capture and reuse methanol alcohol; and
- Decrease in waste generation.



## CRYSTAL FILTRATION AND DAIMLER-CHRYSLER, TRENTON ENGINE PLANT

Laura Hallam, Senior, Civil Engineering Student  
Lawrence Technological University  
Project Title: Continuous Loop Filter

Ms. Laura Hallam was assigned to Crystal Filtration and the Daimler-Chrysler, Trenton Engine Plant to test prototype filters on aluminum machining processes at Daimler-Chrysler, an

automotive manufacturer located in Trenton, Michigan. They manufacture and assemble 3.3, 3.8, and 4.0 liter V-6 engines for minivans; and a majority of their operation involves machining aluminum heads for engines.

Ms. Hallam was successful at installing two continuous filters on existing part washing operations that used roll filter media. The new installation removed one ton of soiled filter media from the plant's waste stream, with cost savings of up to \$5,000 per year. The change-over allows the plant to consider recycling opportunities for the segregated aluminum turnings. Plant personnel are planning to expand the scope of the project to all of their wash and coolant operations. This change would eliminate up to 410 tons of filter media from entering the landfill each year, and generate an annual cost savings of approximately \$2,000,000.



## **H & L ADVANTAGE, INC.**

Alexander Reed, Junior, Mechanical Engineering Student  
Grand Valley State University  
Project Title: Power Factor Correction and Energy Efficiency

Mr. Alexander Reed was assigned to H & L Advantage, Inc., a plastic injection molder and assembler located in Grandville, Michigan. The company manufactures plastic parts for the furniture industry.

Mr. Reed was successful at implementing a number of pollution prevention projects that lower electrical energy consumption and lead to significant cost savings. The primary project consisted of an electrical power mapping study that identified several areas to pursue with equipment changes that would lower electrical energy consumption. The changes included a power factor correction for the molding presses, lighting retrofits for the plant and office areas, and automatic light switches. Other areas with significant cost savings were maintenance corrections to the compressed air system, and the insulation of chiller pipes that eliminated excess condensation and delivered cooler water to the presses. Results included the following:

- Changing existing metal halide fixtures to more efficient T-8 fluorescent fixtures, which saved almost 100,000 kilowatt-hours (kWh) of electricity per year (56 percent reduction in electric usage), with a cost savings of \$6,000 annually.
- Low power factor correction with the implementation of a switched bank of 150 kilovolt-ampere reactive capacitance installed on new and existing presses, eliminated \$3,500 of current and future electrical utility penalties, along with an \$800 refund. The project has a 28 month payback.
- After testing and inspection the compressors, airlines, and associated processes, it was recommended to lower the presser by 10 pounds per square inch. The change did not effect plant operations, and electrical energy costs were estimated to be about \$800 per year.



## INTERFACEFABRICS, INC.

Stephanie Jagusch, Junior, Production Design and Manufacturing Engineering Student  
Grand Valley State University  
Project Title: Reduction in Wastewater Generation and Energy Efficiency Retrofits

Ms. Stephanie Jagusch was assigned to InterfaceFABRICS, Inc., a text tile manufacture and seat cover designer of commercial interior fabrics located in Grand Rapids, Michigan. The company manufactures seat covers for General Motors, Daimler-Chrysler, and Ford Motor Company. They also manufacture floor tile for industrial operations.

Ms. Jagusch was successful at implementing a number of pollution prevention projects that reduced industrial wastewater generation from the Tenter frame production process, lower electrical energy consumption, and reduce product defects associated with operator's color vision. All of the changes will result in significant savings with reasonable paybacks. The following is a summary of the significant projects that were implemented/investigated to date:

- **Tenter Frame:** The installation of a new electronic feedback-based latex foaming process will reduce waste generation by automatically compensating for in-line variations, which produced \$6,800 of cost savings per month from reclaimed chemicals and labor; with a payback of less than 11 months, which justifies the installation.
- **Lighting Retrofits:** Lighting retrofits in the plant and office areas with potential savings up to 119,700 kWh per year of electricity, with cost savings of \$11,900 of electricity energy by replacing 62, 1000 watt, metal halide indirect lighting fixtures with 62, 6-lamp, T-5 high output florescent lighting. The T-5 fixtures are being installed in banks of five or more until all of the retrofits are completed. Other changes would include automatic light switches and sensors for low occupancy areas.
- **Color Vision Discrimination:** Completion of a study revealed no glaring color deficiency among employees (associates). Associates with average to low color discrimination were directed to pay closer attention when working with problematic colors, or to ask a co-worker for assistance, depending on the severity of the impediment. Although the study produced no significant changes in plant operations, it did add value to their quality assurance program.
- **Recycling and Waste:** Investigated licensed waste haulers, which resulted in closing out a contract in order to enter an agreement with Recycling Concepts Incorporated. The change would result in \$2,100 per month of cost savings; charities would still be able to salvage fabric as in an earlier agreement.



## LEADERSHIP IN ENERGY AND ENVIRONMENT DESIGN (LEED) FOR EXISTING BUILDINGS

Elliott Schmitt, Senior, Civil Engineering Student  
Lawrence Technological University  
Project Title: Leadership in Energy and Environment Design (LEED) for Existing Buildings (LEED-EB) Certification

Mr. Elliott Schmitt was assigned to La Solucion, Inc., a small filter media manufacturing company located in Detroit, Michigan. They manufacture filter media for variety of plant applications.

Mr. Schmitt was successful at determining the various prerequisites and credits that La Soluciones needed to acquire the LEED designation through research. Mr. Schmitt collected documentation for management to help them understand what the process entails and the alternatives to meet LEED-EB requirements. In addition, several upgrades were made to the building, such as the installation of fluorescent lights, air regulators and hoses, an oil/water separator, and dedicated recycling areas. Although La Solucion was not able to receive the LEED-EB designation with the assistance of the intern; they were able to pursue several recommendations, as well as several major steps to reduced energy consumption with significant cost savings.



## **MICHIGAN TOOL AND GEAR, INC.**

James Khlaif, Senior, Electrical Engineering Student  
Saginaw Valley State University  
Project Title: Wastewater Reduction and Energy Efficiency Retrofits

Mr. James Khlaif was assigned to Michigan Tool and Gear, Inc., a power-train component manufacturer located in Corunna, Michigan. The company manufactures axles, transmission components, and other related power train components.

Mr. Khlaif was successful at investigating several pollution prevention strategies that reduced natural gas consumption, corrected the power factor to reduce electrical energy consumption, and reduced waste disposal generation. The company was able to close in on several cost savings projects with attractive paybacks. The primary projects included:

- **Wastewater:** Researched an evaporator process to reduce wastewater generation. The evaporator would eliminate a large majority of the discharge, while a precipitation process would pre-treat the discharge to acquire a lower discharge rate. The wastewater is a combination of industrial rinse processes and 50 percent is mop water. Installing an evaporator would generate \$23,141 annual cost savings with an 18 month payback.
- **Heat Recovery:** Fabricated an indoor cooling chamber to heat treated axles and other power train components. This will act as an auxiliary heating source and improve production speed, decrease 7,029 million cubic feet of natural gas per year, and an associated \$73,385 of annual cost savings.
- **Power Factor Correction:** Conducted a study to determine capacitance requirement to correct the existing power factor problem. Penalty charges over the last seven months totaled \$2,574. This will also provide the necessary information that will help Michigan Tool and Gear, Inc. plan for future expansion.



## **MICHIGAN DEPARTMENT OF NATURAL RESOURCES (DNR)**

Philip DePetro, Senior, Environmental Engineering Student

Michigan Technological University

Project Title: Michigan State Park's Self-Inspection Pollution Prevention Project

Mr. Phillip DePetro was assigned to the DNR, Parks and Recreation Division, a governmental agency with their central office located in Lansing, Michigan. The agency regulates activities at all state-owned parks and recreational facilities.

Mr. DePetro was successful at implementing a self-inspection program that reduces energy and hazardous chemical usage through the implementation of standardized practices statewide. The program consists of two tools: an audit form for evaluating waste generation, products usage, energy and water consumption; and the Self-Inspection Pollution Prevention Program (SIP-2) that is primarily a self-inspection checklist. The SIP-2 identifies potential pollution prevention and energy conservation ideas that can be applied to park facilities. The program is scheduled to be completed within the term of one non-camping season.. Measurable results will be available within two years after initial implementation. Together, these tools offer monetary savings and increased efficiency as welcomed benefits.

